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ABSTRACT

This learning unit on computers is one in the Choice Series, a self-learning development program for supervisors. Purpose stated for the approximately eight-hour-long unit is to enable the supervisor to identify the components of a computer system, establish benefits to be obtained from using a computer, understand how a computer can provide useful information, and explain to workteam members the use of computers in their workplace. An introduction provides an overview of the unit and lists unit objectives. Parts A through C contain informative material, activities and answer keys, self-checks and answer keys, and a summary. Topics include the computer system, computer applications, and processing information. Part D contains performance checks--an end check to be completed alone and a tutor check and work-based project. Part E consists of a brief unit review, extensions (print sources of additional information, such as units or sections in books), and a list of references. (YLB)

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An Open Tech Project

SUPERVISING

TECHNICAL ASPECTS OF SUPERVISION

40: Computers

U.S. DEPARTMENT OF EDUCATION
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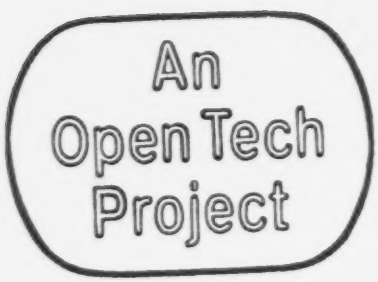
40: COMPUTERS

David Austin



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David Austin
Computers (Number 40 in the CHOICE SERIES of learning units)

Series Editor: Harry V Pardue
Northern Regional Management Centre.

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WORKING GUIDE TO THIS UNIT IN YOUR DEVELOPMENT PROGRAMME

This Unit is now your personal property - it's not for handing back to your training officer or to a tutor. It is your working book.

The Contents will increase in value to you each time you write on one of its pages. This is a working text for your personal notes - without notes its value is limited.

Qualifications forget about certificates and diplomas - you don't need them for this programme. What you do need is the wish:-

* to do your job better
* for personal development

Your study time is really up to you - we guess you will need about 8 hours in total. But it's your time - spend as long as you like.

How am I doing? you can judge for yourself by checking out how well you cope with the tasks we call Activities and Self Checks which occur throughout the unit. You can also get the Tutor Check and/or the Work Based Project to your tutor for an unbiased view of your progress.

Work Pace it's really up to you and depends on your interest. However, if you do well on the Activities and Self Checks, you could afford to speed up a little. Of course, if you don't do as well as you expect then you could slow down a little or flick back into the unit for a quick review of the more difficult ideas.

When in doubt - ask or seek help from:

* your family and friends
* colleagues at work
* your company training staff
* other open learners
* your tutor, by phone, by a visit to your support centre or by dropping your tutor a line through the post.

Don't worry if what you learn doesn't seem to be of use to you now, remember that times change - it may be useful one day. Anyway, just knowing more improves personal confidence.

So now make a start:-

40: COMPUTERS by David Austin

ABOUT THIS UNIT

Without doubt, computers are playing an increasingly important part in our industrial, commercial and personal lives. Some see computers as a welcome development and a blessing, whilst others view them as just another electronic gadget to complicate their lives.

This unit should help you to understand the role that computers can play in offices and factories and how they can assist you and your colleagues to make a more effective contribution to the process of industrial management.

It is only by an understanding of both the capabilities and the limitations of computers that we can take advantage of their now well-established place in our society and apply them to improving the efficiency of our places of work!

IN THIS UNIT WE WILL:

* Identify the components of a computer system
* Establish the benefits to be obtained by using computers
* Indicate how a computer handles DATA, and how computer PROGRAMS are produced
* Explore the impact of computers upon our working lives, and upon industry in general

AUDIO TAPE
Side 1

Before you continue through the unit, you should listen to side 1 of the audio tape that accompanies this unit. You will find it useful if you refer to the unit objectives shown below whilst you listen to the tape. You may wish to make the objectives clearer to yourself by making a note or two on the page as you listen.

OBJECTIVES

When you've worked through this unit you will be BETTER ABLE to:

* identify and describe the various parts of a computer system
* establish what benefits can be obtained from a computer system
* understand how a computer can be used to provide you with useful information
* explain to members of your workteam the use of computers in their workplace

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PART A THE COMPUTER SYSTEM

1 Introduction

The first thing to realise when thinking about computers is that there are quite a number of separate pieces which go up to make a computer 'system'. At the same time, there are all sorts of new words and terms (jargon) to get used to.

You will find that whenever a specialist computer term is used, a definition will be needed. So as not to confuse you with too much jargon straight away, you will find that a full glossary of computer terminology is included in Part E - Extensions.

So whenever you come across a word which you do not understand, look it up in Part E.

The second important point to notice is that, although there are a great number of different computers of various shapes and size and from various manufacturers to be found in factories, shops and offices, they are all very similar in the way they are designed and in the jobs they can do. It is only the relative size (and cost!) which makes one computer better able to handle particular tasks than any other.

When we talk about computers and say something like 'the invoices are produced by computer', we're really referring to a computer system. For anything to happen we need a computer system made up of hardware, software and the people who can understand and operate them.

Let's begin by looking at each of the parts which make up a computer system.

2 Hardware

The best way to understand what is meant by hardware is to think of it as the parts you can see and touch - even when it is switched off!

Although we use the term 'computer' to describe the piece of machinery, we must understand that in fact a computer consists of a number of separate pieces of machinery all linked together. The word 'hardware' covers all the separate pieces either on their own or when connected to form a computer system.

One way of thinking of a computer system is to think of it as a human body.

2.1 Central Processing Unit

The 'brain' of any computer, the central part, which every computer must have, is:

the Central Processing Unit (CPU)

CPU sounds very technical but to all intents and purposes it is just a collection of electronic components wired up in a particular way to perform some quite simple tasks.

Most of these electronic components are the 'silicon chips' we hear so much about - only the size of a thumb-nail, but capable of storing (remembering) vast quantities of information.

The CPU is made up of 3 main parts, which can do things similar to our brains:

* It can do simple ARITHMETIC
* It CONTROLS the operation of other parts of the computer's body

---

ACTIVITY 1
Time guide
1 min

What do you think is the third main thing it can do? (something our brains also do!)

* _____

Well, it can remember the information it is working with. It can also remember its own instructions, but we will deal with this aspect a little later in the unit.

So, our CPU can do three main things:

It can Calculate

Control

Remember (or store)

As well as these three main components of the CPU, there are other units which are used to transfer information INTO the central processor (INPUT); and to transfer information FROM the central processor (OUTPUT).

These parts, which we can think of as the 'eyes and ears' of the computer, are called 'Input/Output' units.

Remember, although we can think of the CPU as the brain of the computer,

IT CANNOT REASON!

SELF CHECK 1 Jot down the three main functions of the central processing unit.
Time guide
2 mins

* _____

* _____

* _____

The main functions of the central processing unit are arithmetic - this means doing all the calculations on the numbers stored in the memory, e.g. multiplying hours worked by an hourly wage rate to give a gross wage; control - this means supervising the work of the rest of the computer, e.g. telling the computer to display some information on the screen; memory - this means holding data, information and programs, for the arithmetic unit to work on, e.g. the hourly wage rate for all employees would be stored here ready for use in wage calculations.

The central processor, on its own, is rather useless - like a head with a brain in it but without a body or a nerve centre without any limbs.

There must be some way of communicating with the central processor, and all computers use additional pieces of hardware to do this. We can think of these parts as the 'arms and legs' of the computer sytstem.

2.2 Getting Information IN

There are various ways to get information into the computer: some are simple and easy to understand; others are more complicated, and would require a lot of technical explanation, so we will only look at the easiest:

The Keyboard

You can type the information in on the keyboard, which is like a normal 'typewriter' keyboard, except that a computer keyboard has a few extra keys. This means that anyone who can use a typewriter (even with just two fingers!) can enter data into a computer. Although this is an easy way of getting information in, it is really very slow, for whilst we are laboriously typing at the keyboard, the rest of the computer is idle.

So, we need some more efficient way to get information in such as:

Punched Cards

When there's a lot of information to put in, we can have the information put onto a lot of cards in the form of punched holes (the computer understands these holes, we don't need to). But we do need a machine to help the computer understand them. This is:

A Card Reader

The advantages of this method are that several operators can be 'punching' data into cards at the same time and the computer itself is not being held up.

Once the cards have been punched and 'verified' (checked by a different operator) then many hundreds of cards can be read into the computer very quickly (approx 1000 cards per minute).

In many large companies, punched cards have been replaced by:

Key-to-Tape, or Key-to-Disc, Machines

On these machines, the data is 'encoded' onto Magnetic Tape or Magnetic Disc instead of being punched into cards. The operation is faster than punching cards, and the tapes and discs containing the data can be read into the Central Processor very much faster.

There are other ways to get information into the computer, but these are very specialised and difficult to understand.

The pieces of hardware, just described, are known collectively as "Input Devices".

ACTIVITY 2
Time guide
1 min

Can you think of one good reason why we might use Magnetic Tapes or Discs to get information into the computer, rather than the keyboard?

* _____

_____

The answer is speed. Computer time is very expensive.

SELF CHECK 2 Respond by completing each sentence with a suitable word or words.
Time guide
3 mins

1 The central processing unit can be thought of as the _____ of the computer.

2 The memory part of the central processing unit is made up of a large number of _____.

3 Punched cards are being replaced as a method for getting information into the computer by _____ units.

The answers to this self check are here in the following words, so you'll need to check out your answer carefully. Typical words you might use: 1 brain: nerve centre; 2 silicon chips: integrated circuits; electronic computers; 3 tape: disc: key-to-tape: key-to-disc.

2.3 Getting information OUT

Having put information IN, we will need to get information OUT. So how is this done?

The Screen

This is very like our TV screen and can be black and white (or green and white) or coloured. Although we can only put words or numbers IN, we can get words, numbers and pictures out.

The main disadvantages of the Screen as a means of communicating information are:

* only a limited number of people can see the screen at the same time and often the information is needed by a lot of people in the company.

* only a limited amount of information can be displayed on a screen at one time. It is not easy to 'look back' if you missed some important point on a previous screen.

ACTIVITY 3
Time guide
1 min

Note down two other disadvantages of using a screen for getting information OUT:

* _____

* _____

Here are the main disadvantages:

* We can only see one 'screen-full' at a time

* We could forget a piece of information when the screen has been switched off.

So, although it's handy to have what we want in front of our eyes while we are in front of the screen, we will usually want to refer to the information again later. This is why we need:

The Line Printer

It is essential that a permanent copy (known as a 'hard copy') of any calculations or other computer work be available for future use, since we don't always need the information shown on the screen immediately.

The commonest form of permanent record comes from a printed report. These can be produced very quickly on a Line Printer. (They are called 'Line' Printers, because they print a complete line at a time, not character by character, like a typewriter.)

There are other methods for getting information out of the computer but, again, these are rather complicated. We will come across one or two in Part B.

The pieces of hardware, just described, are all known as "Output Devices".

Their main function is to communicate the results of any calculations, or other operations, to the outside world - to you, the user.

ACTIVITY 4
Time guide
1 min

So, we have put information IN with:

* _____
* _____
* _____

(Keyboard; punched cards; magnetic tape or discs).

ACTIVITY 5
Time guide
1 min

And we have got our information OUT with:

* _____
* _____

(screen; printer)

We have used the word SCREEN here, but you may also use the term 'VDU' (Visual Display Unit); we will deal with this term a little later.

We have looked at the head, arms and legs of our computer system, we must now look at how these parts are put together to help us in our work. But first, there is a very important function which computers do very well indeed:

2.4 Storage Devices

As well as being able to get information into the computer, perform some calculations on it, and then get the results out again, the computer must have the ability to store information for future use (or else we would have to feed in all the details of a particular job every time we used the computer, such as the Tax code and National Insurance code for all the employees each time the wages were calculated!).

Here is another advantage of punched cards and magnetic tape or discs over a keyboard as a means of getting information IN to the computer - we can use the cards or tapes over and over again.

In other words we are using these to store, or remember, information.

Let us look at the ways (other than Punched Cards) that the computer stores or remembers information:

Magnetic Tape

Magnetic tape, as used by a computer, is very similar to the tape used by domestic tape recorders. (In fact, many micro-computers use domestic cassette tapes to store data and information.)

Information is magnetised onto the surface of the tape, and will remain there almost indefinitely, or until it is intentionally erased.

An average computer tape will hold 40 million letters or numbers per reel. A company can have as many reels of tape as it can afford (magnetic tape is relatively cheap) so that the amount of information that can be retained is virtually unlimited.

The only disadvantage of magnetic tape is that if a piece of information is, for example, half way through the tape, then the tape must be re-wound to the beginning, and then the computer has to read through a lot of unwanted information before finding the bit it was looking for. This results in a lot of time being spent in constantly winding and rewinding reels of tape.

You don't have this disadvantage, however, if you use magnetic discs.

Magnetic Disc

Magnetic discs are very similar to domestic gramophone records, except that the information is magnetised onto the surface, rather than in grooves. Far more data can be packed onto a magnetic disc than can be placed onto magnetic tape; many disc-packs will hold up to 60 million characters of information and, unlike magnetic tape, it is instantly available. The reading 'head' can jump across the disc directly to the position where the information is, without having to search through all the records in between.

An average time to recover some data from a magnetic disc would be measured in millionths of a second, as compared with several minutes, in the case of magnetic tape.

The pieces of hardware, just described, are known collectively as "Storage Devices".

SELF CHECK 3 Time guide 5 mins

Respond by completing each sentence with a suitable word or words.

a Screens are examples of _____ devices. They are used to get information _____.

b Line printers are so-called because they print a complete _____ at one time.

c Presentation of information on a screen can be in either words and figures, or _____.

d Magnetic tapes and _____ are the commonest type of storage device.

e Magnetic discs are capable of storing _____ quantities of information, and we can then _____ our information almost instantaneously.

The answers to this self check are here in the following words, so you'll need to check out your answer carefully. a) Screens are output devices used to get information out of the computer. b) Line printers print a line at a time unlike typewriters which produce a letter at a time. c) In the form of pictures. You may also have used a word such as 'graphical' or 'pictorial'. d) Magnetic tapes and magnetic discs are the commonest type of storage device. e) The advantage of magnetic discs is that they can store large quantities of information which we can retrieve or access almost immediately.

EXTENSION 1 Page 62

For more information on the HARDWARE of a computer system, look at Chapters 2 and 3. A far more detailed presentation is given there, but there is a lot that will be of no use, so just ignore any sections you don't understand.

EXTENSION 3 Page 62

Check out the following words in the GLOSSARY:

* HARDWARE
* CENTRAL PROCESSING UNIT
* INPUT DEVICES
* VISUAL DISPLAY UNIT
* OUTPUT DEVICES

REFERENCES 2 and 3 Page 66

Technical descriptions of all items of HARDWARE appear in the reference books. If you are interested in the technical details, look up the term in the index.

3 Software

If we thought of hardware as the body, arms, legs and head of the computer then software is the thoughts, words and deeds carried out by the body.

Software itself can be divided into two main categories:

* Programs. (Note the spelling!) These are the instructions which tell the computer what to do and when to do it.

* Data. These are the facts and figures upon which the computer works.

  Look at this sum: 23.18 + 14.16 =

  The data here is:

  The + sign and the = sign
  The 2 amounts

The + sign and the = sign tell us what to do with the data. We could call these the "Program".

If I ask you to remember a set of numbers and to add them together, I am telling you what to do. In other words, I am programming you. (Notice the spelling of 'programming'.)

The main difference between programs and data is:

PROGRAMS ARE SELDOM CHANGED
DATA CHANGES CONSTANTLY

For example, the way our wages are calculated each week is basically the same but the hours worked, bonus earned and wages due will change from one week to another.

In order to ensure that we are paid exactly what we are due each week, a precise series of instructions need to be carried out, either manually using pen and paper (and probably a pocket calculator!) or by computer.

These precise instructions would be called a computer 'program'.

There are quite a few instructions needed in order to calculate our weekly wages and, because the computer cannot reason for itself, we must tell it precisely what it must do. The instructions must be accurate because, as you may recall, computers cannot REASON for themselves. (The computer will not know if we have made a mistake or have given it the wrong instructions. It obeys each instruction absolutely literally!) A computer could quite easily send you a gas or electricity bill for one million pounds. It would never know how ridiculous this is!

Computers hardly ever make mistakes. If anything goes wrong, it is usually that we haven't given precise enough instructions or even, in some cases, given it incorrect instructions.

In the same way that the instructions we give to the computer must be absolutely correct, so also must the data which we ask the computer to work with.

There is a saying in computer circles:

"Garbage In, Garbage Out".

This means if we give the computer incorrect data to work with, then the results it gives will also be incorrect.

SELF CHECK 4 Write down the two main components of Software:
Time guide
5 mins

* _____

* _____

The answers to this self check are here in the following words, so you'll need to check out your answer carefully. Typical words you might use are: a) Programs, instructions, in other words the instructions which tell the computer what to do. b) Data, information, numbers, words which the computer will work with.

One of the most important facilities which a computer has is the ability to REMEMBER (or Store) instructions.

Part of the 'memory' of the CPU is used to store programs (sets of instructions) and to obey these instructions in respect of any data, words or numbers we care to enter via one of the various Input Devices.

Large computers are capable of remembering more than one set of instructions at a time and can therefore be working on several different jobs at the same time (thus saving valuable operating time!).

EXTENSION 3
Page 62

If you are not sure about some of the terms we've used so far you might like to check out the following words in the GLOSSARY:

* SOFTWARE
* INSTRUCTION
* DATA
* PROGRAM

REFERENCES
2 and 3
Page 66

If you would like more information about software you'll find these references useful.

4 Personnel

There are four groups of people who are directly concerned with any computer system:

These are:

* Systems Analysts - who decide how the computer should tackle any particular tasks.
* Programmers - who write the detailed instructions in a language the computer can understand.
* Operators - who work the machine, feeding in data, collecting the output and looking after the computer in general.

ACTIVITY 6
Time guide
2 mins

Who do you think is the fourth group of people concerned with any computer system? (Perhaps the most important of all!)

*_____

It's YOU the user!

Computers exist to help you to work more efficiently. By doing all the dull repetitive calculations which are necessary in almost everyone's job, it saves us time to do more important work. But, as we shall see, there is a lot of very useful and important work computers can do which is by no means dull and repetitive.

Let's now see how all these parts are put together in order to be of some use to us in our work. As we shall see, the parts can be put together in a number of different ways to suit different purposes.

EXTENSION 3 Page 62 Check out the following words in the GLOSSARY:

* SYSTEMS ANALYST

* PROGRAMMER

5 Putting the Parts Together

We have seen how a computer system is made up of three separate parts:

the hardware

the software

the personnel.

All three parts must be working together correctly if the computer is going to serve us properly.

There are a number of ways in which the parts can be put together, depending upon:

the size and importance of the task required

the cost (in time and money) which can be allowed for the task.

Let us start with a simple example.

We may wish to keep an up-to-date list of our most important customers: their names, addresses and telephone numbers.

ACTIVITY 7
Time guide
2 mins

Why might we want the computer to do this task? Write down your ideas and then compare them with the suggested answer below:

* _____
* _____
* _____

Well, it wastes a lot of valuable time looking up telephone numbers in the telephone directory every time we want to contact one of our customers. Also, if we keep a list of telephone numbers on a piece of paper, it soon gets dirty and torn.

It would be easier if we could display a list of important telephone numbers on a screen every time we wanted it (and also, of course, print out a fresh list whenever a telephone number changed or the old one got lost or torn).

So what sort of a computer system would we need to deal with this problem? Obviously, not a very complicated one nor one which would involve much cost (in time or money).

ACTIVITY 8
Time guide
10 mins

Write down what pieces of HARDWARE would be needed to handle the telephone-list project;

* _____
* _____
* _____
* _____
* _____

You should have written down the following parts:

A Central processing unit to control all the operations. (Every computer system MUST have a CPU.)

A Keyboard to enter the names and addresses and telephone numbers into the computer and to enter a request for a telephone number to be displayed on the screen.

A Screen so we can see the list and use it when we need it.

A printer to print out a copy of the list for us to use when the computer is not available. (It could be engaged on more important work than our telephone list!)

Magnetic Tape or Disc to store the telephone list until the next time we need to use it.

These were the hardware parts of the system but what about the other parts?

Well, there would also be the Software; you will remember that this consisted of Programs and Data.

We would need a program to get the information from its storage place, on magnetic tape or disc, and show it up on the screen or print it out onto paper.

The Data is, of course, the names, addresses and telephone numbers themselves.

What about the third part of our system, the personnel?

Well, before we could use the telephone list on the computer, someone must have told the computer what we wanted. The system analysts and programmers would have done this when it was first decided to produce this system.

But, of course, you, the user, would be part of the system, by going to the keyboard and actually using the program to get some information.

The system we have just described would certainly be very simple and would not cost very much at all. However, in certain cases, a system like this could become very much more important and could, therefore, include some very specialised 'parts'.

Many of our large banks and building societies do much of their work on the telephone - transferring money around the country and around the world. In order to help them, their computer systems have been developed so that it is only necessary for someone to touch a telephone number displayed on the screen and the call is made. There is no need to look up a number or even to dial the number - the computer does it all for us!

This brings us to another aspect of putting it together:

COST AND SIZE

Obviously there is a difference in size and cost between our small personal telephone list and the international calling system used by the banks.

Our system would only require the minimum in size, both in respect of hardware and in terms of the quantity of data which the system must keep track of. On the other hand, the banks would require very sophisticated machines which link their computers to the telephone lines. Similarly, they will need to store vast quantities of data and information and will therefore need very large storage capacities in their computer.

ACTIVITY 9
Time guide
5 mins

What do you think will be the two main differences between the computer which we will use for our telephone list and the computer used by the banks?

* _____

* _____

The first difference will be in size (and capacity). The banks have very large computers.

The second difference will be cost. A computer to handle programs, like our telephone list, could cost anything from a few hundred pounds to two or three thousand pounds, whereas the huge computers owned by the banks could cost in the region of one or two million pounds.

We call the small computer: "Micro-computers"
The large computers are called: "Main-Frames"
Those which fall between two types are called "Mini-computers."

Let us look at a different example.

A factory employing 1000 people produces a large range of audio equipment, which it designs and assembles from bought-in components. Information is required on a variety of areas such as:

'How much stock of components do we have?'
'How many faulty products were made last week?'
'Are our customers paying their bills on time?'

To answer these and similar questions quickly and without having to spend a lot of effort hunting through mountains of paperwork, we need a computer system which, although not as big or as expensive as the mainframe computer used by the bank, is a bit more sophisticated than the smallest micro-computer.

As well as providing the sort of information, mentioned above, we may also want the computer to help in the design of new products or even to help in production - but we will look at these applications in Part B.

So what will the differences be between this computer system and the simplest one which we described earlier?

Well, for a start, quite a lot more data and information must be handled and it must be available to a lot more people in the company at the same time.

Secondly, it will require a good deal of effort in deciding exactly how the computer will answer these and other similar questions. This will require a staff of competent systems analysts and programmers to get the computer to give us exactly what we want, when we want it and in a way we can easily understand. The company will employ these staff permanently, so that they can get to know exactly what the managers and supervisors need from the computer.

Thirdly, we will need a computer with more than one screen:

ACTIVITY 10
Time guide
2 mins

Why would we need more than one screen?

* _____

Because more than one or two people will want to be using the computer at the same time. The store-keeper will want to know how many of a particular item to order and will not want to wait until someone else has finished using the computer before he can get his information.

We will also need some way for the store-keeper to ask the computer for the information without him having to waste time walking to the room where the computer is kept. The answer will be to have a number of keyboards (or other input devices) available throughout the factory and offices.

Both of these problems (a screen and a keyboard for the store-keeper) can be solved by using a piece of equipment (hardware) called a 'terminal', which is a keyboard and a screen together. This can be placed in the store-keeper's own office but will be linked to the company's computer by a cable.

The storekeeper appears to have his own personal computer but there can be quite a number of terminals in the offices or workshops of employees throughout the company, all linked to one computer.

If the factory or store was situated at some distance from the computer then the terminals would be linked to the computer by telephone lines.

Finally, our computer will need more storage capacity than the micro-computer. We can easily provide this by adding more magnetic tape or magnetic disc units. (There is almost no limit to the number of magnetic tape or discs which can be used by a computer system.)

SELF CHECK 5
Time guide
5 mins

Note down the four differences between a computer system to handle the audio products factory and the computer system to produce a personal telephone list:

* _____
* _____
* _____
* _____

The answers to this self check are here in the following words, so you'll need to check out your answer carefully. The computer for the audio factory would need: more data and information; reliable, permanent computer personnel; terminals in the offices of managers and supervisors; more storage capacity.

Every company will have different computer requirements, depending upon its needs. Usually the bigger the company, the more its needs and therefore the bigger and more expensive its computer. We must try to get the balance right, ie not too big and not too small. Time and money can be wasted by getting a computer system which is not big enough for the job, just as easily as buying too big a computer.

What we can see from the previous two examples is that although computers can differ in size, as regards their hardware, basically they still consist of the same parts which we introduced in Part 2:

Hardware - more or less depending upon the needs of the user.

Software - Data and Information upon which the computer works and the programs (instructions) to handle the data.

The People - You, the user, together with some specialist personnel to translate your requirements into a language the computer understands.

EXTENSION 3
Page 62

Check out the following word in the GLOSSARY:

* TERMINAL

6 Summary

A computer system consists of:

* Harware
* Software
* People

Hardware consists of:

* A central processing unit
* Input devices
* Output devices
* Storage devices

Software consists of:

* Data and Information
* Programs

The People involved in a computer system are:

* System Analysts
* Programmers
* Users

Large computers are called 'mainframes'.

Small computers are called 'micro-computers'.

Those which come between the two are called 'mini-computers'.

A computer system requires all the parts to be working together for the benefit of the user.

PART B COMPUTER APPLICATIONS

1 Introduction

Now that you have some idea of what a computer is and how it works, let's look at the ways in which computers are put to work. In this part of the unit we will be looking at two types of work in the factory and in the office. Computers are helping us in both of these areas by performing in a matter of minutes tasks which would take us either hours, or even days, to complete, leaving us free to get on with more important work.

Remember, computers cannot reason for themselves but they can do tasks which involve a large number of calculations very quickly and accurately, so long as we have given them precise instructions in the form of a program.

2 Computers in the Factory

Although there are many uses to which computers are put in the factory, we will only look at three.

These are:

* To help with production planning and stores records
* To help in the design of new products
* To control machines, either by way of measuring such things as temperatures or pressure or more directly, by controlling robots which perform some automatic, repetitive jobs.

Firstly, then we will look at how computers are used to help us keep track of all the details of the jobs going on in the factory.

2.1 Production records

Most supervisors and managers in factories suffer from a common problems - there is so much going on that it's very difficult to keep track of jobs as they pass from one operation to another. At the same time, there are so many components in any product that it seems a miracle that we can make sure that we get the right quantity at the right time.

Obviously a lot of planning and organisation must go into this task, otherwise our production lines would soon grind to a halt.

In order to keep the production lines going we need to have answers to some of the following quesions:

* what products are going to be made?
* how many have we to make?
* when have they to be ready for?
* have we got enough raw materials?
* how fast do the machines go?
* have any machines broken down?

There are many more questions like these which need to be answered if we are going to keep productivity high.

ACTIVITY 11
Time guide
2 mins

We agreed in PART A that computers can: * calculate

* control

* remember or store

Which of these three characteristics will help give us the answers we need to these questions?

* _____

It is the ability to store large amounts of information which enables a computer to help us, by providing answers to these questions.

By using the large storage capacities of magnetic tape or magnetic disc, a computer can keep a record of all the materials and components needed to manufacture any product and can tell us, in a matter of seconds, whether we have enough in stock or whether we need to buy more. (How often has a job been held up because someone forgot to order some vital parts!?).

If we tell the computer how many materials and parts are needed to make one particular product, it will store this information and will be able to tell us how many we will need to make a batch (all the calculations will be done for us by the computer).

If we also tell it which machines the product must be made on and how long it takes to make, the computer will do all the necessary calculations to tell us how long it will take to manufacture a batch and will work out a schedule to make best use of the available machines. To do this ourselves would mean many hours of laborious work with paper and pencil - time which could be far better spent in productive work.

We saw, in Part A, an example of how a computer 'terminal' might be installed in the store-keeper's office. This terminal would be used to get information about the quantities of items held in the store.

ACTIVITY 12
Time guide
5 mins

Can you think how this system could be used to help to plan and control the flow of work on the shop floor?

Write down your ideas and then compare them with the suggestions made below:

* _____

* _____

* _____

Well, one way would be for the computer to check whether or not there were enough parts or materials in stock to make up a particular order and, if not, to display a message to the storekeeper telling him to buy in the necessary parts.

Another way in which this system could help would be that the storekeeper could be warned in advance of the quantities of various parts needed by the production lines and could make sure that there would be enough parts ready when they were needed.

In these cases, the computer is acting as a 'record-keeper', using its ability to STORE information and its ability to display its information, when and where required.

Quite a different role is played by the computer in the next application, which makes use of its ability to perform complicated calculations and to display information pictorially.

2.2 Computer-aided Design (CAD)

One of the most impressive uses to which computers are being put is in the area of design.

All products have to be 'drawn' or 'designed' in very great detail before they can be made.

These drawings must be made to scale and must be extremely accurate, because they are the blueprints from which all the production plans are made. A small error in a drawing or a design could result in an expensive waste of materials and time.

The task of the designer is to convert an idea into a blueprint, from which the product can be made and this blueprint must be drawn out on paper, so that others can see exactly what is required.

ACTIVITY 13
Time guide
2 mins

When we draw anything on paper, no matter how accurate we do it, there is one major shortcoming.

Jot down what you think that might be.

*

Anything written or drawn on paper can be seen in 'TWO DIMENSIONS'. That means we can't see it from the side or from the back. How nice it would be if we could draw something in THREE dimensions and look at it from any angle.

ACTIVITY 14
Time guide
2 mins

Which aspect of the computer, which you looked at in Part A, do you think could assist in solving this problem?

*

It is the ability to display information in 'pictorial' form on a screen.

You could also have mentioned the ability to perform a lot of very complicated calculations necessary to 'see' an object in three dimensions.

A very good example of this technique is to be found in the car industry, where new designs can be tried out and displayed on a computer screen, without having to make up models to see what they look like.

Similarly, individual parts and components can be designed as well as the whole product. Scale drawings can be produced by letting the computer do all the calculations, thereby letting the designer spend more time creating newer and better products.

In this application, it is not the computer that does the designing, but more the designer using the power of the computer to help him do his job more efficiently.

The computer can also help by storing away designs on magnetic tape or disc and then, using a special type of printer, draw out the designs to scale when required. At the same time, any small amendments or improvements to the drawings can be made with a minimum of effort and without needing to draw the whole thing again from the beginning.

In order to make the amendments or improvements even easier, the computer screen can be adapted, so that the designer can actually draw directly onto the screen with a specially adapted 'pen', which will tell the computer to alter the drawing and then display the new design, so that the designer can check that his alterations have been made correctly.

The computer can also be made to magnify sections of a drawing on the screen, so that alterations can be made to even the smallest component.

2.3 Computers controlling machines

It is surprising to realise how common it is for a computer to control a machine. We need only look at such everyday things as washing machines, cookers and cars to see how far computers have become a part of our technology.

In the factory too, computers have been adapted to control the actions of many of the machines used in production, particularly actions which are difficult or dangerous to be done manually and to control them far more precisely than has ever been possible before.

This is called computer-aided design which is often referred to by its initial letters CAD.

A good example is when an oven or kiln must be kept at a certain temperature in order to function efficiently. A computer can be linked to instruments to measure changes in temperature and can be programmed to take the necessary action in the event of the temperature falling below a particular level (by turning on the power!).

Another example, which is linked to the previous application (design), is where a computer is used to control the cutting out of a shape in either metal or fabric, according to a precise design. This ensures that every piece cut will be exactly the same. (Remember, the computer will obey its instructions every time without any variation.)

One step further from a computer being used to control a machine is when the computer and the machine are almost the same thing. This is the industrial robot.

Most modern production lines employ automated methods to achieve increased productivity. Automation means that machines perform actions automatically but still require to be 'programmed', ie they still need to be given precise instructions. This is a very specialised application of computers but the principles are the same as for any of the other applications.

These are:

* The ability to store information
* The ability to perform calculations
* The ability to obey instructions
* The ability to communicate with us, the user.

SELF CHECK 6
Time guide 5 mins

Respond to each statement by writing TRUE or FALSE in the space provided.

a) Computers can do the work of a machine in the factory. _____

b) A computer can keep tabs on the number of parts left in the store. _____

c) A computer can display a 3-dimensional picture of any product. _____

d) Computers can design new products themselves. _____

e) An industrial robot is controlled by a program. _____

The answers to this self check are here in the following words, so you'll need to check out your answer carefully. a) Computers themselves cannot do any work. They can only control the work of other machines, so this statement is false. b) It's true to say that keeping stock records on magnetic tape or disc is one of the many useful functions a computer serves in a factory; c) Computer screens (VDUs) can show a 3-dimensional image of an object and can change the angle of view to suit the observer, so this is true. d) A computer cannot reason for itself, so it's false to think that computers can design new products. However, it can assist in the design of a new product by doing a lot of intricate calculations and showing the results on the screen. e) Every computer application requires a set of instructions in the form of a program. It's true that robots are no different.

3 Computers in the Office

To give us an idea of how computers are used in the office, let us take a look into a typical office. What do we see?

ACTIVITY 15
Time guide
2 mins

Jot down some of the pieces of equipment you would expect to see in any office.

* _____
* _____
* _____

You may have thought of quite a number of things but at the very least we would expect to see:

* a desk and chair
* a typewriter
* a filing cabinet
* a telephone

Let's look more closely at those items.

* The desk and chair - they are there so that we have somewhere to do our work and the more we have to leave the desk and chair, the less work we will get done. If a computer can mean staying at our desk longer, then we will get through more work, in less time.

* The typewriter - How many times do we make little mistakes and have to start again? Or how often do we have to type the same letter (or one very similar) to several different people? If we could get the computer to correct our poor typing and check our spelling, our letters would be far more likely to impress our customers.

* The filing cabinet - How much time do we spend looking for a letter or price-list which has not been put back in the right place (or not put back at all!)? Sooner or later, documents are going to get damaged or mislaid, so if the computer could do our filing for us, life would be far easier.

* The telephone - It is forever ringing, interrupting our work but, of course, letting us pass on and receive important information to colleagues in our own organisation and to customers and suppliers.

So, how can a computer help to make life easier in the office? Let us remind ourselves of the problem areas:

* moving away from our desk to find some information

* typing many similar letters to different people

* looking for lost documents in a filing cabinet

* keeping track of all the telephone messages

Now let's look at some of the office applications of computers.

* A desk-top 'terminal' (we have already mentioned terminals in the factory) which will let us access all the facilities of our large computer.

* A 'word-processor' where the computer operates as a typewriter but does not print any letters until we are absolutely satisfied with them. We can also add a program whereby the computer will check our spelling against its own dictionary.

* A 'database' filing system which uses the computer's power to store (remember) large quantities of information and allows us to look at the information, on the screen, as many times as we like, without having to take anything from a filing cabinet.

  In fact, more than one person can be looking at the records at the same time, without getting in each other's way.

* An electronic mailing system in which the computer sends and collects messages for us, even when we are not there. The computer will tell us that there is a message for us as soon as we return to our office and turn on the terminal.

ACTIVITY 16
Time guide
5 mins

Note down FOUR ways in which a computer can be used to improve the efficiency of an office

* _____
* _____
* _____
* _____

Here are four ways in which the computer can help:

* A desk-top terminal can give us access to all information kept on the computer
* A word-processor can save a lot of time and effort, typing letters
* A database filing system can keep all our important documents ready for us to look at whenever we want to.
* An electronic mailing system can keep track of all our important messages, even when we are not in the office.

EXTENSION 4
page 65

If you are interested in looking more closely at these and other applications of computers in the modern office, then you might like to take up this extension.

One advantage of the applications we have just mentioned is that very few additional pieces of hardware need to be bought. We would probably already have a line printer (this would be used to type out all the letters prepared with the word-processor); the database would be kept on the magnetic disc unit: all that would be needed would be some extra terminals and a special adaptor to join the computer to the telephone system.

What a database is and how the computer can be used as a filing system, we can see from this example.

Suppose we wished to keep a record of all our customers; their names, addresses, telephone numbers, etc. We would probably keep either:

a card index

or

a loose-leaf file.

These would be kept in alphabetical order so that we will know where to find a record when we are looking for it.

A computerised filing system, a 'database', would have all the information about one customer on one 'screen'.

Instead of looking through all the cards or files until we found the one we were looking for, we would type in the name of the customer on the keyboard and the computer would search through all the records on the magnetic disc until it found the one which we had asked for and then display all the details on the screen.

ACTIVITY 17
Time guide
3 mins

Jot down two possible advantages of having a computerised filing system to do this job instead of a card index or loose-leaf file.

* _____

* _____

---

* A computerised filing system is far quicker

* You don't have to leave your desk to get the information you want.

Many important decisions can be taken by using the computer as a reference book and by saving time hunting for information, which might have got damaged or mislaid if we were using a filing cabinet.

EXTENSION 3
Page 62

Check out the following words in the glossary:

* WORD PROCESSOR

* DATABASE

We have looked into a small office and seen how a computer can help with the everyday tasks which need to be dealt with but there are quite a few other jobs which can be handled by a computer and to understand these we will have to look into some bigger offices.

We won't be able to look at every type of office, so we will look at just two:

* a travel agency

* the local council office

These two examples are from completely different walks of life but all can benefit from the use of a computer in their offices.

Let us recall what we have already learnt about the main features of computers.

They can:

* STORE large amounts of information

* FIND any piece of information extremely quickly

* DISPLAY any piece of information on a SCREEN or PRINTER

So let us see how these facilities can be used to advantage in the two offices mentioned above.

The Travel Agency

ACTIVITY 18
Time guide
3 mins

Suppose you go into a travel agent's office to book a holiday. Jot down two of the things the agent needs to know before he can make arrangements for you.

* _____

* _____

You may have thought of several things but a list would probably include:

* what tours are going to the destination we fancy

* whether there are any vacancies on the tour we select

* whether the agent can be sure that someone else has not booked the same holiday

In order to make sure that we get the holiday we want and to make sure of our reservations on the plane, boat or train, a computer terminal in the travel agent's office will be linked to other computers in the offices of the airlines and the tour operators. Simply by entering questions regarding the holiday required and the dates when we can take our holiday, on the keyboard of the terminal, the information which is held in the large computers belonging to the airlines can be displayed on the screen in the office of our travel agent.

REMEMBER. Computers can be linked to each other through the TELEPHONE system.

ALL the travel agents will have a terminal in their office, all linked into the same mainfram computer belonging to the airline companies.

Next time you are in a travel agent's office, look out for this terminal. It will probably be on full view for all the customers.

The main computers belonging to the airline companies and tour operators will store all the details of seats available on each flight and will allocate these to customers by receiving a message from the terminals in the offices of the travel agents all over the country. It is a case of FIRST COME, FIRST SERVED. There is no need to wait while applications are sent through the post. Once the computer has made a booking for you, then you can be sure that no-one else can book your seat as well. All that remains is to wait till the computer sends the official confirmation of your holiday together with tickets and reservations.

This system is just an extension of the filing system which we saw in the small office.

ACTIVITY 19
Time guide
1 min

So what does it use to store all the information about hotel rooms, seats or planes and trains etc?

* _____

What storage device is likely to be used to keep the information?

* _____

The travel agent's filing system uses a database and the information will be kept on magnetic tape or magnetic disk so that it only takes a few seconds to find any particular piece of information and display it to anyone who requires it.

SELF CHECK 7
Time guide
5 mins

Decide whether the following statements are TRUE or FALSE.

a) A computer can answer the telephone for you. TRUE/FALSE

b) A computer can check the spellings in any letter or report you prepare. TRUE/FALSE

c) Computers can 'talk' to each other over the telephone. TRUE/FASLE

d) You could book a continental holiday by computer. TRUE/FALSE

The answers to this self check are here in the following words, so you'll need to check out your answer carefully. a) In general, computers are not equipped with a voice but they can record messages in the same way as a telephone answering machine. So this statement is false. b) It is true that most word processing programs have a dictionary as part of their instructions, so that any words that are not spelt properly will be reported to the operator. c) It is quite usual for computers to be linked together by telephone. Of course they use their own electronic language, which is far faster than English speech. d) Most travel agents have terminals in their offices which are linked to the computers of the large tour operators, so that messages and bookings can be sent automatically, so this statement is true.

Now we will look at a completely different kind of office.

The Local Council Offices

Local councils need to store vast amounts of information.

ACTIVITY 20
Time guide
3 mins

Spend a few minutes thinking about some of the things local councils are responsible for and jot down THREE types of information on which local councils would need to keep files.

* _____
* _____
* _____

The list could be a very long one. Here are just a few examples:

* rent records for every house or flat owned by the council
* rates records for every property in the area controlled by the council
* stores records for all the departments engaged upon building or maintaining the roads, buildings, sanitation, etc. belonging to the council
* wages and salary records for all the employees of the council (this includes all the teachers in the schools in the area as well as all council workmen).

It seems obvious that, to keep track of all these different types of records, a council will need the kind of facilities that the computer can provide. Most, if not all councils, use a large computer to keep their records up to date.

In this case, there will be more than one 'database'. There will be a separate database for each of the problem areas just mentioned but they will all be kept on the same computer. Different departments will be using different parts of the computer system at the same time. For example, one person could be looking at a rates record, whilst someone else, in another office, could be entering, into the housing records, details of hours worked and materials used on a particular job.

The computer system in a local government office will be one of the largest but will still only be performing the same operations as the other systems we have seen.

ACTIVITY 21
Time guide
3 mins

Write down what you remember these main operations to be:

* _____

* _____

* _____

I hope we can agree that the main operations are to:

* store large quantities of information

* find individual pieces of information quickly

* display any piece of information on a screen or printer

We have now seen how computers can help us, both in the factory and in the office, by looking at a few examples.

There are many more examples of the way in which computers can make life easier for us but we would find that the basic features would be the same in each case.

COMPUTERS CAN "STORE" LARGE AMOUNTS OF INFORMATION

WE CAN "GET AT" THE INFORMATION VERY QUICKLY

THE COMPUTER CAN DISPLAY ITS STORED INFORMATION ANY WAY WE WANT.

EXTENSION 1
page 62

A selection of typical computer applications, including the two we have just looked at, is presented in Chapter 7.

4 Summary

Computers can be used in the factory:

* to keep records of everything produced
* to assist in the design of new products and components
* to control automated machinery (industrial robots)

Computers can be used in the office:

* to type letters and documents
* to 'file' information for future reference
* to act as a telephone answering system, by collecting messages for us when we are out and sending messages to our colleagues.
* to link in with computers in other offices and use the information stored in them
* to assist in the preparation of records for large organisations such as local government council offices

The functions of computers which are used in factories and offices are:

* the ability to store large amounts of information
* the ability to find individual pieces of information when asked
* the ability to display information on a screen or printer, in words or pictures

PART C PROCESSING INFORMATION

1 Introduction

In Part A and Part B we looked at two aspects of computers:

What computers ARE;

and

What computers DO.

In this part of the unit we will look at another aspect of computers:

How computers do what they do.

This does not mean how they work in an electronic sense but how they process the information which we put in, so that they can produce the type of answers we need to help us in our work.

In order to get some idea of how computers work on information, we will look at the 'software' in more detail. This will involve an examination of the way in which a computer is 'programmed' and how we can make sure that the information which is being worked on is correctly entered in the first place and presented in the best possible way in the end.

This section will finish with a few points on how to use a computer yourself. However, this can only be very general because each type of computer might need some slightly different commands to make it work (in the same way as different types of car or washing machine need different commands to make them work).

2 Collecting, Processing and Presenting Information

To introduce the basic ideas about how a computer deals with information, we will look at a household operation which is controlled by the same sort of 'programming' as a computer - the automatic washing machine. Most modern automatic washing machines have a small computer as part of their mechanism, which only has one set of instructions. Of course there are often quite a few 'programs' so that different types of washing loads can be catered for but they are all concerned with the actions of the washing machine.

So let us look more closely at this everyday activity. We need to give the machine some precise instructions so that it can perform our washing tasks for us. Firstly we will list the main activities we wish to carry out:

* wash

* rinse

* spin

Sometimes we will want it to repeat some of these activities, for example we might want the machine to:

wash
rinse
spin
rinse (again)
spin (again)

There would not be a separate instruction for the second rinse and spin but an instruction to repeat the first rinse and spin.

Each of the above activities now needs to be broken down into more precise instructions, ie the instruction WASH might consist of the following steps:

* 1 Turn on water
* 2 Turn off water when drum is half full
* 3 Get soap powder from holder
* 4 Turn drum clockwise 10 times
* 5 Turn drum anti-clockwise 10 times
* 6 Repeat steps 4 and 5 five times
* 7 Turn on pump to get rid of dirty water
* 8 Repeat the whole operation 3 times

It is very important that these instructions are carried out in exactly the right order, or else our washing day could end up as a disaster. Our washing machine has a small computer in which these instructions are 'stored'. Remember, the computer cannot reason for itself: it relies on us to give it instructions - to 'program' it.

In the same way as we have constructed a program for washing, we could write down some instructions for:

Rinse
and Spin.

These sets of instructions would then be put together, so that we, the operator, can select the program we want, in order to handle a particular washing day task.

We rely on the fact that the machine will not spin before it rinses or that it will not leave dirty water in the drum when it has finished. All of these requirements will have been included in the 'program' which controls the washing machine.

In this example, the program is stored permanently in the control section of the washing machine and is the only program the machine understands. In our commercial computers, the same principle applies, except that we can give it a large number of different tasks, each one controlled by its own program.

ACTIVITY 22
Time guide
5 mins

Write down a set of instructions to perform the activity "rinse" in our washing machine example. (Don't worry if you miss out some of the steps, the important thing is to get your steps in the correct order.)

* 1 _____
* 2 _____
* 3 _____
* 4 _____
* 5 _____
* 6 _____

Here is a suggestion for the rinse program:

* 1 Turn on water
* 2 Turn off heater when drum is half full
* 3 Turn drum clockwise 10 times
* 4 Turn drum anti-clockwise 10 times
* 5 Turn on pump and empty drum
* 6 Repeat the set of instructions twice

Your own program could be a little different from this, for example, it is purely a matter of choice as to how many turns of the drum are made or how many times the water is changed. Different washing machine makers will have slightly different programs to do the same activity - the important thing is to make sure that they are done in the correct order.

Now that you have a basic idea of how a machine can be given a set of instructions, we will look a little more closely at how a computer can be made to obey instructions.

In order to do this, we need to go back to the concepts we introduced in Part A. You may remember, the hardware part of the computer system was concerned with:

getting information in (input)

processing the information

getting information out (output)

The software part of these operations consists of three similar activities:

collecting information (input)

performing some calculations on the data (processing)

displaying the results of the calculations (output)

2.1 Collecting Information

We saw, in Part B, that many of the applications to which computers are put in factories and offices rely on us, the user or the operator, giving the computer some information to work on. There are two main types of information which we need to give the computer:

* Permanent or semi-permanent information which we want the computer to store for future use, so that we don't have to feed the same information in every time we use the computer.

  eg

  price lists

  rate of pay

  names and addresses of customers and suppliers

This sort of information need only be collected once and stored on one of the storage devices such as magnetic tape or disc. There will be a great deal of data to collect in this manner, since all the database applications we saw in Part B rely on the computer having collected all the necessary information before we try to use it.

* Temporary information which is changing all the time:

  eg

  hours worked each day

  raw materials issued to the shop-floor

  deliveries made to customers

This type of data will be collected continuously, every day, and will only be stored whilst it is being used.

Both these types of information being collected have one important thing in common:

THEY MUST BE ABSOLUTELY CORRECT IN EVERY DETAIL

Remember, the computer cannot reason for itself, it has no way of knowing whether the information we give it is correct or not. If we do not give it correct data to work on, we cannot expect it to give us the correct answers (garbage in, garbage out).

The responsibility, for making sure that the information that the computer uses is correct, is ours - the users. However, there are some ways in which we can get the computer to help to ensure that the data we enter is correct.

There are three main methods which can be employed to help ensure that the data entered into the computer is as accurate as we can make it.

* **Data validation**

ACTIVITY 23
Time guide
3 mins

Suppose you have a pile of over two hundred invoices in front of you for varying amounts. Any for more than £250 have to have special authority for payment.

How would you sort out the invoices which needed special authority for payment?

* _____

You probably thought that you would go through the pile checking the amount and separating any for £250 or more. The names and addresses, goods supplied, date etc wouldn't interest you, nor would the actual amounts.

You would just be checking one particular item of information.

Most computer applications include a special program to check each item of data as soon as we enter it and before it is used by the main part of the program. This is called:

DATA VALIDATION

What a data validation program does is to perform a series of tests on the data we enter. The more tests that can be performed, the more likely the data is to be correct.

The sort of tests that could be performed might be:

- Is the entry a WORD or a NUMBER?
- If the entry is a value, is the value reasonable?

  i.e. is it no higher than what we might expect?
- If the program requires 7 separate entries, have all 7 been entered? Or has one been omitted?
- Where an account number or personnel code has been entered, is the code a valid one?

There are a wide variety of tests that could be made, some being more suitable for one type of application than another. It is up to us to devise the best series of tests for the task we are asking the computer to perform.

* Passwords

Our second precaution is also one which people have used for a long time.

ACTIVITY 24
Time guide
2 mins

How have soldiers guarding a military encampment traditionally challenged people at night to make sure they are authorised to come in?

* _____

They ask them for a password which is only known by authorised people.

The same precaution can be taken to ensure that only valid USERS or OPERATORS can enter information into the computer.

Only authorised users know what the passwords are so that the computer will not allow unauthorised persons to try to get information in or out.

An example of this is the PERSONAL IDENTITY CODE you use when using the automatic cash dispensers at your local bank. Even if someone knows your account number, they could not get any information about your account without also knowing your personal identity number. This is an example of a PASSWORD.

* Data verification

When a large number of transactions are being entered into the computer, we would probably employ one of the methods, other than the keyboard, that were discussed in Part A.

These were:

PUNCHED CARDS
KEY-TO-TAPE
KEY-TO-DISC

It is very easy to make mistakes when keying-in a large number of similar letters or figures. Even the best typists sometimes make mistakes, so it would not be unusual to expect some errors to be made when many hours are spent entering data.

ACTIVITY 25
Time guide
2 mins

Can you suggest one way in which two typists could thoroughly check each other's work? _____

The most thorough way would be to get both of them to type the same thing and then compare one against the other.

This is what happens when a large number of computer transactions are entered into a computer.

In order to try to eliminate as many of this type of error as possible, a method of duplicating the work is used. What happens is that two operators both key in the same data; the second operator acts as check on the first. It would be a very long co-incidence if both operators made the same simple typing error.

This form of checking is called:

DATA VERIFICATION.

The second operator 'VERIFIES' the work of the first.

By employing all of these three methods, we hope to ensure that the information that finally gets processed is as accurate as possible.

SELF CHECK 8
Time guide
5 mins

Complete the following statements with a suitable word or group of words.

a) Running a special program to check each item of information entered is called data _____.

b) Authorised computer users have a _____ to make sure only they can get information in or out of the computer.

c) Data verification involves _____ _____ keying in the same data.

d) Data verification virtually eliminates the risk of operator _____.

The answers to this self check are here in the following words, so you'll need to check out your answer carefully. a) Data validation is the checking of each item of information by a special program. b) Authorised users have a password to ensure computer security. c) Data verification involves two operators keying in the same data so that d) The risk of operator errors or mistakes is virtually eliminated.

REMEMBER, computers cannot tell for themselves whether the data we enter is correct, whether it is all there or even if it makes sense. We, the users, MUST take every precaution to give the computer correct words and figures to work on.

If we cannot start off with accurate information, we cannot expect the computer to produce accurate results.

Hence the expression:

GARBAGE IN - GARBAGE OUT

2.2 Processing Information

Once we have given the computer some correct information to work on, we must next tell it what to do with it.

In the introduction to this section, we looked at an example of a set of instructions for an automatic washing machine and mentioned that this type of 'program' was very similar to the 'programs' used by the computers in our factories and offices.

The types of instruction which a computer can obey must be very simple and are generally restricted to such things as:

* ADD or SUBTRACT
* COMPARE one word or number with another - is the first number bigger, smaller or equal to the second?
* READ a word or number from one of its own storage units or from an INPUT unit.
* PRINT or DISPLAY words or numbers on one of its OUTPUT units.

It is surprising how many more complicated instructions can be made up from these simple operations.

Multiply is only continuous adding.

Divide is continuous subtracting.

As an example of 'processing', let us look at a very common computer operation - calculating your electricity bill every three months.

Firstly we must find out what information the computer needs in order to perform this task.

ACTIVITY 26
Time guide
2 mins

Can you suggest the TWO pieces of information which are needed?

* _____

* _____

Well, you should have mentioned:

* The number of UNITS of ELECTRICITY used (kilowatts)

* The PRICE per unit charged by the electricity company

* Your name and address

How does the computer know how many units of electricity you have used?

A regular meter reading will record the number of units consumed. This information will be entered into the computer and will be stored away on magnetic tape or disc. When the next meter reading is taken, the new figure will be compared with the last one and the difference calculated. This difference will represent the number of units used since the last reading.

(Sometimes, the meter cannot be read because we were not in when the man from the electricity board called. An estimated usage figure can be calculated by the computer because it has 'stored' details of all your previous meter readings and will assume that your usage will be similar to previous periods.)

The other piece of information needed is the PRICE per unit. As this will be a fixed amount, the computer will store this figure and will use it every time it makes a calculation. If the price per unit changes (as it sometimes does) only one piece of information in the computer program needs to be changed.

Finally, the computer will be required to prepare a bill for the amount due. The only other information it needs now is your name and address. This information will be kept in a 'FILE' (remember how we described computer records as being like FILING CABINETS) together with the details of your meter readings.

If we examine this exercise more closely, we will see that it uses only the simple set of instructions which were mentioned earlier. These instructions would be arranged in a logical sequence, in the same way as the instructions to operate the automatic washing machine were arranged in a logical sequence.

The 'PROGRAM' itself would be 'STORED' on magnetic tape or disc and would be loaded into the computer only when the electricity board wanted to send out bills. At other times, the computer would be engaged on other tasks.

This is what the program would probably look like:

1 READ THE NEW METER READING (from the keyboard or punched cards)

2 READ the old meter reading (from the records kept on magnetic tape or disc)

3 SUBTRACT the old reading from the new reading to give the UNITS USED.

4 READ the PRICE per unit, from store

5 MULTIPLY the UNITS USED by the PRICE to give the amount due

6 READ the customer's name and address from magnetic tape or disc

7 PRINT out the bill

8 Repeat the whole series of operations for the next customer

As you can see, only very simple instructions are needed. We do not need to tell the computer HOW to READ or HOW to ADD; these abilities are provided in the HARDWARE. All we need to know is what instructions each computer understands, as there are often small differences between one make of computer and another. Also, of course, the size of the CENTRAL PROCESSING UNIT will allow a large computer to perform a bigger series of calculations than a smaller one.

You will see that the processing steps mentioned above rely on the information being correct in the first place. If the wrong figure for a meter reading was keyed in, then the bill that the computer produces could not possibly be correct. It is no use blaming the computer for an error which it did not even know it had made.

ACTIVITY 27
Time guide
2 mins

Here is the program for washing in an automatic washing machine which we looked at earlier.

1 TURN ON WATER.

2 TURN OFF WATER WHEN DRUM IS HALF FULL.

3 GET SOAP POWDER FROM HOLDER.

4 TURN DRUM CLOCKWISE 10 TIMES.

5 TURN DRUM ANTI-CLOCKWISE 10 TIMES.

6 REPEAT STEPS 4 AND 5, FIVE TIMES.

7 TURN ON PUMP TO GET RID OF DIRTY WATER.

8 REPEAT THE WHOLE OPERATION 3 TIMES.

Compare the program shown above for the calculation of an electricity bill with the program for washing clothes.

Jot down one important way in which the two programs are similar.

* _____

The similarity is in the fact that both programs consist of a number of instructions which must be carried out in a precise order if the right results are wanted.

Now that all the calculations are done, we come to the final step.

2.3 Displaying Information

The last part of any computer application is the communication of results back to us - the users.

We saw, in the section on hardware, that there were two main methods to get information out of the computer:

The SCREEN
The PRINTER

ACTIVITY 28
Time guide
3 mins

Here is a list of items of information we might want from a computer.

Decide whether you would want that information to appear on a screen or to be printed out.

*	telephone number for a customer	SCREEN/PRINTER
*	payslips for all employees	SCREEN/PRINTER
*	amount of raw material in stock	SCREEN/PRINTER
*	bills for customers	SCREEN/PRINTER
*	price of a product	SCREEN/PRINTER

When we want an immediate answer to some problem, such as the telephone number for a particular customer, the price of a particular product or, perhaps, the amount of a raw material in stock, we would ask for the information to be displayed on the screen.

On the other hand, if we were using the computer to calculate the weekly wages for all our employees or to prepare the electricity bills for all our customers, then we would want the results to be printed out.

REMEMBER, information which is displayed on the screen is only available temporarily. Information printed out onto paper is available permanently.

Also, only a few people can see the information displayed on the screen, whereas many copies of reports can be printed out. Every employee of the company could have a copy of a letter or report. (Line printers operate very fast.)

We saw, in the previous section on processing, that a computer program could give the instruction:

```
PRINT.
```

Although we would not need to tell the computer HOW to print, we would need to tell it WHERE to print.

For example, if we were using the computer as a word processor to send letters to all our customers, we would tell the computer to print the address of the customer in the top left hand corner of the page and to print our address in the top right hand corner of the page.

Similarly, if we are using the computer to print out electricity bills, we must tell it exactly where to print each line and when to miss out lines. These are all fairly simple instructions and help us - the users - to understand what the computer is trying to tell us.

In the same way, if we want the information displayed on the screen, we must tell the computer exactly whereabouts to display the information. If we did not give it any more precise instructions, any information would be shown up in the top left hand corner, as if the screen was a piece of paper.

We can help to display information to the best advantage by making use of all the facilities which are provided by screens:

e.g. Some information would be better displayed as a picture or diagram rather than perhaps a long list of figures.

Contrasting colours can be used to draw attention to important figures. (Minus figures shown in RED.)

So it's possible to produce information in the form of graphs, pie charts and bar charts in a wide combination of colours. What's more, if we want the information printed out, it doesn't necessarily have to be on to paper. We may prefer to have it printed on the transparent acetate sheets so we can use it on an overhead slide projector.

Because screen display is one of the fastest of the computer's operations, a large amount of information can be made available very quickly. This can be very important when information is needed to make a decision.

Another very important aspect of the use of the screen to display information is to give instructions to the operator.

Many computer programs are quite complex and require the operator, or user, to enter codes at certain points during the running of the program. The screen can be used to remind the operator about what has to be done next.

The more instructions the user is given, the easier it is to make best use of the machine. This technique, for letting the computer help to operate itself, is called:

USER FRIENDLINESS.

Before we go on to that though, perhaps you'd like to go over what we've done so far by tackling this Self Check.

SELF CHECK 9 Respond by completing each sentence with a suitable word or words.
Time guide
5 mins

a) All data and information entered into the computer must be as _____ as possible.

b) Unauthorised use of a computer program can be prevented by using _____.

c) Computer programs consist of a series of _____ in a logical order.

d) If we wanted to know how much stock there was of a particular material, we would _____ the information on the _____.

e) The technique of making the computer give the operator helpful instructions is called _____ _____.

The answers to this self check are here in the following words, so you'll need to check out your answer carefully. a) Remember 'Garbage in - Garbage out'? A computer program is useless without accurate data. You might also have said 'precise' or 'correct'. b) Passwords are what you need to prevent unauthorised entry. c) Computer programs consist of a series of instructions or operations in a logical order. d) We'd display the information on a screen. Screens are used when you want large amounts of changing information very quickly. e) User friendliness means that the computer is programmed to give the operator helpful instructions rather than the operator having to refer to an operating manual.

EXTENSION 1
Page 62

Some examples of how computer programs are developed can be found in Chapters 4 and 5.

3 "Hands-On" - using a computer

No matter in which part of an organisation you work, sooner or later you will need to use a computer yourself. Some supervisors need to use computers more than others - depending upon the type of work done and how much of the company's information is kept on a computer.

If the company has a large 'mainframe' computer, then it is very unlikely that you would need to operate it - as there would be properly trained 'computer operators' to do this. You may, however, still use the computer by using a 'terminal'.

You may remember that a large computer may have a large number of terminals connected to it, either by cables throughout the building or by means of a telephone line.

If, however, the company uses a smaller 'mini-computer', or several 'micro-computers', then it is very likely that you will need to use it.

Not all computers are the same, so it is not possible to give a set of rules for operating a computer which would be true in every case. (In the same way that different cars or washing machines need different operating rules.)

There are, however, some points which are always true and which can cause you some problems if you are not used to using a computer. Here are a series of points which you may find useful when you need to use either a terminal or a micro-computer. They are all the sort of thing which can cause you to make mistakes and possibly waste valuable time.

ACTIVITY 29
Time guide
3 mins

Suppose you have to make a transatlantic telephone call in the middle of the day when telephone charges are at peak rate. What would you do before you made the call to make sure that you kept the cost down?

* _____

_____

_____

You would probably make some notes about the topics you wanted to cover and you would make sure you had any information you might need to hand.

The same applies to using a computer.

* HAVE ALL YOUR DATA READY

Computer time is expensive - possibly more expensive than yours - so don't waste time looking for data. Before you switch on make sure you have all the data you need to key in in front of you.

It is usual, for control purposes, to keep a 'diary' or 'log' of all persons using the computer. This is to record who has been using the machine and for how long. Sometimes the time used is charged to the different departments, so it is important to account for all time spent on the computer. It is also important to plan the use of the computer so that no-one need be kept waiting too long if someone else is using the machine.

* HAVE THE USER GUIDE TO HAND

Most computer programs now are 'user friendly' and help the user by giving instructions on the screen.

But it is possible that some programs have not had this useful facility built into them. So, always have the OPERATING INSTRUCTIONS or USER GUIDE handy. These should give you precise details of how to use a particular program. If you are still in doubt, ask.

If you enter wrong instructions, you cannot break the computer. The worst that can happen is that you might lose some of the valuable information which is stored, not only for you, but for everyone else in the company, so be careful.

ACTIVITY 30
Time guide
2 mins

Suppose you want a print-out of some information to take away with you overnight.

What piece of hardware would you have to make sure was connected to the computer?

* _____

You'd have to make sure the line printer was connected if you wanted a print out. You'd also need to check that the printer contained a good supply of paper. The computer won't know whether there is enough paper there for what you want.

* MAKE SURE THE LINE PRINTER IS CONNECTED IF YOU WANT A PRINTOUT

* CHECK WHICH PROGRAM YOU WANT

When you first switch on, the computer will not know what you want to do, so you must tell it which 'program' you wish to use. All the programs will be kept on either magnetic tape or disc. You must ask the computer to find the program you want.

If you are using a micro-computer, then the programs will be kept on magnetic discs. You must make sure that the discs you use are the correct ones. The computer relies on you to place the correct tapes or discs into the 'storage devices'.

This is even more important when you are giving the computer new information. For example, if you gave it a tape containing last year's prices, it would still try to obey its instructions. It would have no way of knowing that you have not given it the most up-to-date information.

* GET ALL THE INFORMATION YOU NEED FROM THE SCREEN

When you are asking for some information to be displayed on the screen, remember that only one screenful of information can be viewed at a time. As soon as a new screenful of information is seen, the last information cannot be recalled without going back to the beginning.

So be sure you have got all the information you need before going on to the next topic.

* WHAT TO DO IF YOU MAKE A MISTAKE

If you make a mistake, the computer may realise this. (Remember the use of a data validation program.) Most computer programs ask you, at regular intervals, whether you wish to change anything, giving you the chance to start again, otherwise it may be necessary to press an abort key and start again.

(All computers and terminals have some kind of abort key which will allow you to cancel an entry and start again.)

* CHECK THAT YOU'VE FINISHED BEFORE YOU SWITCH OFF

When a computer is switched off any information that is not stored on magnetic tape or disk is lost.

So, never switch off the machine until you are sure that you have finished everything you need to do. (And be careful that someone else does not switch off while you are still using the machine.)

* HANDLE WITH CARE

A computer or terminal is a delicate piece of equipment and should be treated with respect. They do not take kindly to having coffee spilt onto them or being used as an ashtray. It is usual to forbid smoking or the consumption of food and drink in rooms where computers or terminals are kept.

SELF CHECK 10 Respond by completing each statement with a suitable word or words.
Time guide
5 mins

a) If a computer is accidentally switched off, you will _____ all the information in its memory.

b) You must ensure that there is enough _____ in the line printer before using it.

c) If a mistake is made, it may be necessary to press the _____ key.

d) A minute-by-minute record of a computer's activities is called the _____.

e) The _____ will contain detailed instructions on the operation of the computer.

The answers to this self check are here in the following words, so you'll need to check out your answer carefully. a) You have to take great care not to switch off a computer accidentally, otherwise you will lose or destroy all the information in its memory. b) You must ensure a line printer contains enough paper before you use it. You may also have thought that you have occasionally to check the ribbon. c) Every computer will have an abort key which will enable you to go back to the beginning if you make a mistake. d) This is called a log. It keeps a record of who used the computer, how much time was taken and for what purpose. e) The user guide or manual contains detailed information on the operation of the computer.

EXTENSION 2
Page 62

More precise instructions on the operation of any computer will be given in the User Guide or Manual supplied by the manufacturer. Look up the operating instructions for any computer either at your work or wherever else you can find one.

4 Summary

Computers handle information in THREE steps:

* Receive some data or information from the user
* Process the data by performing some calculations on it
* Display the results of the calculations to the user

Information handling is controlled by a program.

A program consists of a series of simple instructions given in a logical order.

Data received from the user can be subjected to a series of test for correctness:

* Data Validation
* Authorisation (passwords)
* Data Verification

Information can be passed back to the user:

* Displayed on the screen
* Printed out on the printer

Information displayed to the user can be made as meaningful as possible by using colours, pictures and well-designed screens.

Instructions for the assistance of the user can be displayed on the screen as part of the program. This is known as:

* user friendliness

Different types of sizes of computer require slightly different operating instructions. These should be written out fully in an:

Operating guide

PART D PERFORMANCE CHECKS

Time guide 60 mins

1 End Check

You may review your understanding of the unit as a whole by completing this group of questions. Don't guess the answers - if you're not sure, flick back into the unit and check before responding.

If you are still unsure then put a question mark against your response before proceeding.

TRUE/FALSE

Respond to each statement by writing TRUE or FALSE in the space provided.

1 A computer system refers to the central processing unit. _____

2 The central processing unit contains a large number of silicon chips. _____

3 The fastest way to get information into the computer is by the keyboard. _____

4 The people who operate computers are known as software. _____

5 A computer cannot check whether the data you give it is correct or not. _____

6 Computers can do the work of a typewriter in an office. _____

7 Computers can remember everything you tell them, even when they are switched off. _____

8 A computer needs a program in order to tell it what to do. _____

COMPLETION

Respond by completing each sentence with a suitable word or words.

9 If we want the computer to store information for later use, we must use either _____ or _____.

10 When we want to use the computer as an electronic filing-cabinet, we will use a _____ program.

11 A program that is used to check the accuracy of data being entered is called _____.

12 Small computers are call "micro-computers", large computers are often known as _____.

13 It would be possible for every manager or supervisor to have a _____ in his office, linked to the main company computer.

14 A computer program consists of a number of separate _____ arranged in a logical manner.

15 A screen is used to _____ information to the user.

MULTIPLE CHOICE

Respond to each question by putting a mark against the ONE answer which is most correct.

16 Which of the following is a storage device?

a) screen
b) magnetic disc
c) program
d) keyboard

17 Which of the following attributes is the most important to the computer user?

a) size
b) cost
c) speed
d) colour

18 Which of the following computer applications would you expect to see in a busy office?

a) computer-aided design
b) stock recording
c) word processing
d) banking

19 A database is a computerised -

a) magazine
b) telephone answering machine
c) holiday booking system
d) filing cabinet

20 Which of the following units is not a storage device?

a) magnetic disc
b) punched cards
c) line printer
d) magnetic disk

21 Unauthorised use of a computer can be protected by the use of -

a) data verification
b) passwords
c) data validation
d) locked doors

22 All calculations are carried out by -

a) the arithmetic unit
b) the program
c) the memory unit
d) the keyboard

23 Which of the following phrases best describes the benefits of computers?

a) they save us time
b) they never make mistakes
c) they work very, very fast
d) they always obey their instructions

END CHECK - Checkout

Audio Tape
Side 2
35 mins

The answers and explanations for these End Checks are on Side 2 of our Audio Tape. Have your responses with you as you play this tape. As you listen you can check out how well you have done and make notes as you proceed.

2 Tutor Check

Time guide 60 mins

Read the following case incident then deal with the accompanying questions.

Case Incident

For more than 20 years Harry has been the supervisor of the engineers' stores at the Rolling Mill. Young Dave has been learning the job now for over 3 years and feels he knows most of the problems which can crop up from time to time.

Harry is looking forward to retiring to his garden and greenhouse but thinks that no-one could control the stores the way he does.

"Everything is safe up here," he would say pointing to his head. "None of your new-fangled machines could ever replace my years of experience."

Unfortunately, during the last few months, Harry's memory has been letting him down. It has been more than once that he has forgotten to reorder some important parts, which resulted in a hold-up in production.

The factory manager, Mr. Phelps, is of the opinion that young Dave could handle the job if they could get the assistance of the company's computer and that Harry should be persuaded to take his wife's advice and accept the retirement which has been available to him for the last 18 months.

Dave has a few ideas of his own about how the store could be made to run more efficiently but realises that there will be problems.

"How can I keep track of the 2000 or more different items on my own?"

"Who will help me write out the stock-lists at the end of every week?"

"How will I know when the foreman in the mill will run short of some item or other?"

"When am I going to find time to enter all these receipts and issue-notes onto the stock cards without anyone to help? It has taken Harry and me together all our time to keep up to date."

You only need to write ONE or TWO sentences against each question.

1) What hardware would you expect to see installed in Dave's office in order to cope with the problems he has mentioned?

2) How would the computer save Dave time in the preparation of the weekly stock-list?

3) What sort of software would the computer use to keep tracks on all the stock items? (The stock cards which Harry and Dave used to fill in every day could be dispensed with.)

4) How would Dave get the details of stock issues and receipts into the computer? How would he know how many of any particular item there should be? (Without having to go to the other end of the store to count them!)

Send to tutor

Now get your answers to your study tutor either by post or handing it over personally. You will receive your tutor's assessment and comment back through the post as soon as can be managed.

3 Work-Based Project

Time guide 60 mins

As we have seen there are many different makes and sizes of computers in our factories and offices.

For this project, your company should own some kind of computer or else you should be familiar with a company or organisation which does.

1) Find out what hardware is used and describe what each part is used for.

2) Describe the main applications to which the computer is being used:

in the factory

in the office

3) Describe the use you, or one of your colleagues, makes of the computer system as part of your day-to-day routine.

Send to tutor

Now get your answers to your study tutor either by post or handing it over personally. You will receive your tutor's assessment and comment back through the post as soon as can be managed.

PART E UNIT REVIEW

1 Return to objectives

Having completed your work on this unit let's review how you feel about each of our four opening objectives. I will repeat them here and add comment:

You should now be better able to:

* IDENTIFY AND DESCRIBE THE VARIOUS PARTS OF A COMPUTER SYSTEM

We have covered the elements which make up a computer system quite thoroughly, so you should have no difficulty in this area, although, of course, the technology is changing all the time.

Now our second objective.

You should be better able to:

* ESTABLISH WHAT BENEFITS CAN BE OBTAINED FROM A COMPUTER SYSTEM

No matter in which area of our business activity the computer is used, it will save time and money. Its speed and accuracy can only be of benefit to us when used properly.

Now our third objective.

You should be better able to:

* UNDERSTAND HOW A COMPUTER CAN BE USED TO PROVIDE YOU WITH USEFUL INFORMATION

The ability of the computer to store (remember) information, to find individual pieces of information and to display this information to us quickly and accurately, is fundamental to all computer systems and is the reason why so many companies are taking advantage of these facilities.

And our final objective.

You should be better able to:

* EXPLAIN TO MEMBERS OF YOUR WORK TEAM THE USES OF COMPUTERS IN THEIR WORKPLACE

Now that you have seen the ways in which computers can help and assist you to give a better service, by making use of the powers of computers you should be able to take an objective look at the way in which men and machines can work together in harmony.

* MEN DO THE THINKING

* COMPUTERS CAN DO THE CALCULATING

I hope that this work you have done was enjoyable and useful enough to encourage you to continue your studies.

2 Extensions

I recommend that you take up as many of these extensions as you can. They will further increase your understanding and interest. You will also be able to check out a number of ideas that I mention in the Unit. The extra time and effort will prove very worthwhile.

EXTENSION 1 Book: "Computers and Commonsense"

Authors: Roger Hunt and John Shelley

Publisher: Prentice/Hall International

This book is put together in a straightforward down-to-earth manner and provides sufficient information for readers to gain a good fundamental appreciation of the principles of computers.

EXTENSION 2 Computer Operating Guide - Every computer has individual instructions which are relevant to itself only. These instructions are in addition to the general hints on using a computer which I mentioned in Part C. You should read the Operating Guide for the computer at your workplace and add the information to general points you should already know.

EXTENSION 3 Glossary of Computer Terms

Here is an alphabetical list of some of the technical terms used in this unit with a brief description of their meaning. For further details look up the words in one of the References mentioned in section 3 of this part.

* Arithmetic and logic unit (ALU) This is the part of the central processing unit which carries out all the calculations. All computers must have one of these units.

* Card reader This is a machine which is used to input data and information, that has been punched onto cards, into the computer. It operates a lot faster than a keyboard and is used when there is a lot of data to be processed at once.

* Central processing unit (CPU) This is the brain of the computer. It is made up of three sections - the arithmetic and logic unit, the memory unit (or core store) and the control unit.

* Control unit This is the part of the central processing unit which directs all the other parts of the computer.

* Data This is a term used to describe raw facts, which are subsequently processed by the computer to produce useful information.

* Database A large collection of individual pieces of data which are organised like a filing-cabinet, so that a user can 'look-up' any item quickly.

* Data Processing A term used to describe the work of the computer in converting data into information, especially when the work is to analyse large numbers of transactions.

* Execute Tell the computer to obey the program which it is currently holding.

* Hardware This is the machinery itself, the various pieces of equipment that go to make a computer system. It includes all the electronic components and wiring inside the machines as well as the outside casing.

* Input The operation of entering data into a computer system. An input device is any piece of hardware used to get data into the central processing unit.

* Instruction A statement in a computer program which tells the computer what to do at any given time.

* Key-to-tape/* Key-to-disc These are input devices which place data onto magnetic tape or magnetic discs, which are later input to the central processing unit. These are the fastest methods of all to get data into a computer.

* Load Find and start a particular program.

* Log-on Start a session on a terminal.

* Log-off Finish a session on a terminal.

* Line printer This is the machine which produces letters, reports and statements. These are much faster than typewriters but can produce almost perfect print.

* Main-frame computer This term is used to describe the largest of all computers. Only very large organisations can afford to use these very powerful machines.

* Magnetic tape/* Magnetic disc When we want to store data and information for future use (after the computer has been switched off) we record it magnetically on tapes or discs. These can later be read back into the computer by placing them into a machine (tape drive or disc drive) which converts the data on the tape or disc back into a form that the computer can work on.

* Memory unit This is a section of the central processing unit which holds the data and information which the rest of the central processor is working on. When the computer is switched off, all the data in this memory is lost. It must be stored on magnetic tape or disc for further use.

* Micro-Computer A term used to describe the smallest type of computer. These are most used either in the home, or else by individual managers and supervisors to solve business problems. They can of course be linked up to larger computers, either directly or through the telephone service.

* Mini-computer This is a very misleading term as it refers to medium sized - smaller than a mainframe, but larger than a micro-computer. Most of the computers used in our offices and factories are really mini-computers.

* Modem An attachment to a computer which allows it to be connected to other computers by the telephone.

* Output The operation of getting information out of of the computer once it has been processed. An output device is any machine which is used to get information out from the central processor. Without an output, we would not know what the computer had calculated for us.

* Program A set of instructions which tells the computer exactly how we want it to operate. There will be different programs for each job the computer has to perform.

* Programmer A person who gives the computer the precise instructions. He must understand the 'language' used by the computer and translate the requirements of the user into a form which the computer understands. (Computers do not speak English!)

* Run Tell the computer to obey program which it is currently holding.

* Save Place some information on to magnetic tape or disk for future use.

* Software A term used to cover all the programs, data and information which a computer uses. Without any software the computer is an inanimate lump of useless metal.

* Systems Analyst When we want the computer to do a new job for us, we need someone to design the whole system, rather like an architect designs a house. His design will be given to a programmer to translate into computer instructions (like a builder who takes the architect's design and builds a house).

* Terminal (VDU) This is a unit usually consisting of a keyboard and a screen, which is used by operators or managers and supervisors to get information in and out of the computer from different parts of the company, or even from outside.

* Validation This is the operation of checking all the data entered into the computer for accuracy before it is processed. A special program is used which tests each part of the data to ensure as far as possible that no errors exist in the data.

* Verification This is a method of double-checking data entered on either punched cards, key-to-tape or key-to-disc units, where one operator duplicates the work of another. It is very unlikely that two operators would both make the same mistake.

* Visual Display Unit (VDU) This is the technical term for the screen used to display information. It is also commonly used to describe a terminal (which also has a keyboard attached).

* Word Processor This is a program that enables the computer to work like a typewriter. Errors can be corrected before printing, even the spellings can be checked by the computer.

EXTENSION 4 Book: Choice Series Unit No: 63 Communication Systems

Author: Linda Carr

Publisher: Northern Regional Management Centre

These extension opportunities can all be taken up via your Resource Centre.

They will either have the materials or will arrange that you have access to the materials. However it may be more convenient to check out the materials with your Personnel or Training people at work -they may well give you access. There are other good reasons for approaching your own people, for example they will become aware of your interest and you can involve them in your development.

3 References

REFERENCE 1 Book: Computers and Commonsense 3rd revised edition 1983

Authors: Roger Hunt and John Shelley

Publisher: Prentice Hall International

REFERENCE 2 Book: Computer Studies A Practical Approach

Author: Croft G M

Publisher: Hodder and Stroughton 1983

REFERENCE 3 Book: Data Processing and Management Information Systems 4th revised edition 1983

Author: Anderson R G

Publisher: M and E Handbooks

These references can all be taken up via your Resource Centre. They will either have the materials or will arrange that you have access to the materials. However it may be more convenient to check out the materials with your Personnel or Training people at work - they may well give you access. There are other good reasons for approaching your own people, for example they will become more aware of your interest and you can involve them in your development.

If you do wish to make use of these references then don't think that you must read them right through. Just dip into them for a slightly wider treatment of the topic raised by this unit.

I should warn you that the language and style of writing is often difficult to cope with. So don't struggle with it too much. Do what I do when in difficulty, put the book back on the shelf and find a better one!

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